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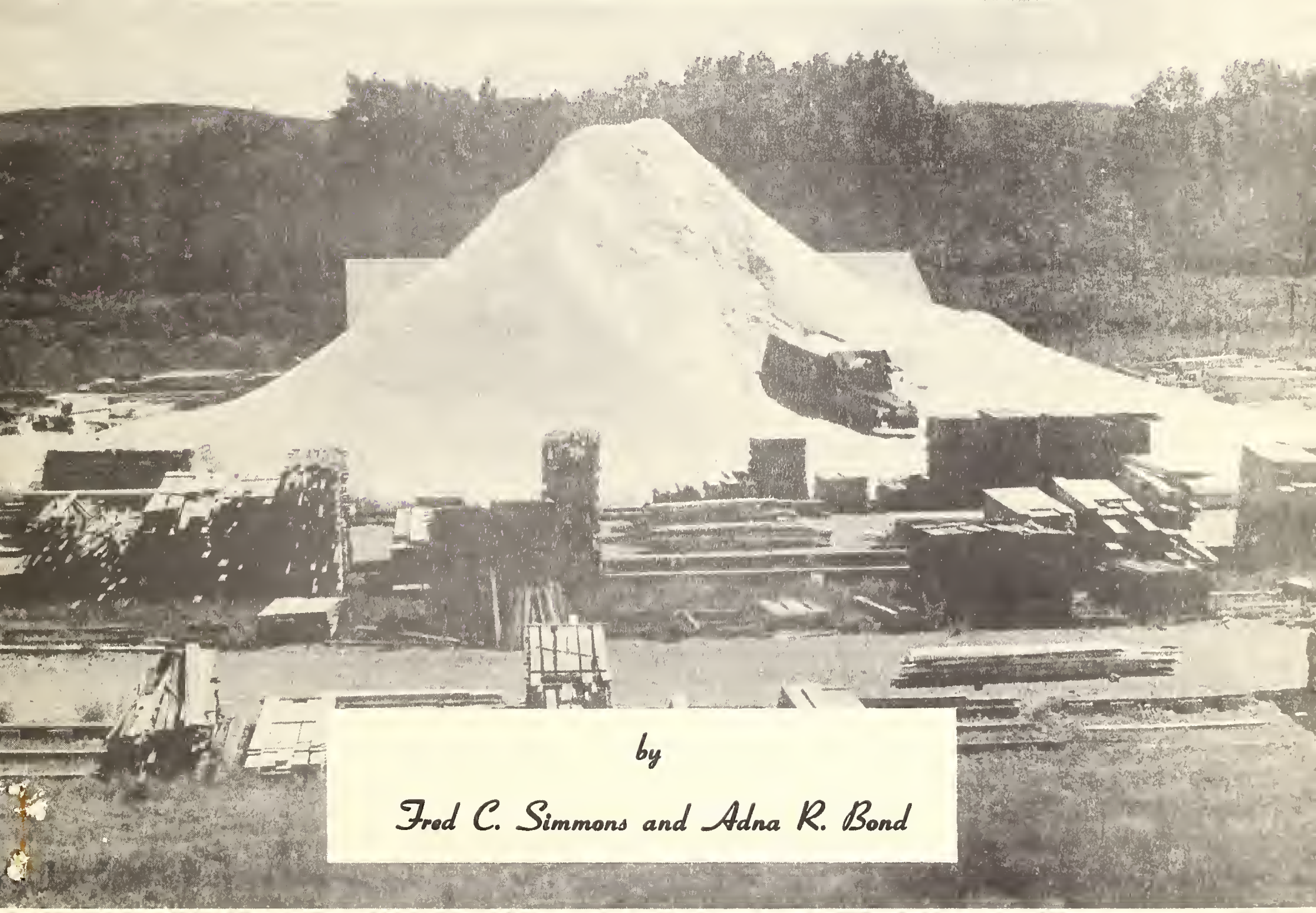
# Sawmill "Waste" in Maryland





by

Fred C. Simmons and Adna R. Bond

Northeastern Forest Experiment Station

Upper Darby, Pennsylvania
Ralph W. Marquis, Director

United States Department of Agriculture • Forest Service

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## in Maryland

by

FRED C. SIMMONS
*Logging Specialist*
*Northeastern Forest Experiment Station*
*Forest Service, U.S. Dept. Agriculture*

and

ADNA R. BOND
*Assistant Forester*
*Maryland Department of Forests and Parks*
*Annapolis, Maryland*

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SAWMILLS HAVE THE REPUTATION of being very wasteful in converting logs and bolts into lumber and timbers. Almost everyone has seen the great heaps of sawdust and slabs that collect at sawmills. Frequently the question is asked, "Why doesn't somebody do something about this terrible waste of wood?"

Sawmill men generally resent the implication that they are wasteful in converting round, rough, and crooked logs into the rectangular boards and timbers the market demands. Some leftovers are unavoidable in doing this. And, to an increasing degree, the term "waste" is inaccurate for describing these leftovers. More and more uses are being found for the sawdust, shavings, slabs, and edgings that our sawmills produce.

To find out what is being done about this "waste," a study was made in Maryland in the summer of 1953. This was a cooperative study, financed jointly by the Maryland Department of Forests and Parks and the U.S. Forest Service. The plan was to make a survey of all the sawmills in Maryland. However, this was impossible for several reasons: some millmen were away at the time; some mills had gone out of business since 1952; and at some mills no information could be obtained.

The mills that were surveyed had sawed about 85 percent of the lumber produced in the State in 1952. So in compiling this report the figures obtained from these mills were expanded to make up for the difference. The expanding of the figures was varied in the different districts according to the judgment of the local District Foresters.

As expected, information about the actual amount of mill residues was difficult to obtain. Mill operators simply do not know, in terms of any standard unit of measure, how much sawdust, slabs, edgings, and shavings they produce. For example, sawdust is often sold by the load---and a "load" varies with the size of the vehicle that hauls it away. Slabs and edgings are usually sold by the "thrown cord," which means the volume of stove-length wood that can be piled rough-and-tumble in a 4 by 4 by 8-foot truck body. Consequently, the only information obtained from the millmen was an estimate of their 1952 lumber production, and an estimate of the percentage of mill residues they had been able to dispose of for different uses.

To get some more reliable figures on the volume of residues produced, we enlisted the cooperation of 11 representative sawmills scattered throughout the State. At these mills, the millmen set aside the residues produced in sawing a known volume of lumber. The volumes of these residues were carefully measured.

The 11 cooperating sawmills produced 103 thousand board feet while the studies were being made. The relationship of lumber volume to residue volume was translated into factors. These factors were applied to statistics of lumber production to get an estimate of the total amounts of residues produced in the State.

The same type of data was obtained from 10 mills in New England. The factors for these mills were found to be so close to those for the Maryland mills that the two sets of data were combined in computing the average factors used.

## THE GENERAL SITUATION

Maryland sawmills were getting along on small logs in 1952, smaller than would be considered worth sawing in many parts of the country (table 1). This is important because, as we will show later, the smaller the logs sawed, the greater the proportion of mill residues. The proportion of the log that is put into slabs and edgings is especially high when logs smaller than 14 inches in diameter are being sawed.

Table 1.--Proportion of total log volume converted into lumber and residues by Maryland sawmills, 1952

| Item | Average log diameter | Total log volume | Product, in solid green wood | | | | |
|---|---|---|---|---|---|---|---|
| | | | Lumber | | Sawdust | Slabs & edgings | Shavings |
| | Inches | M cu.ft. | M cu.ft. | M bd.ft. | M cu.ft. | M cu.ft. | M cu.ft. |
| Hardwoods | 13.0 | 17,947 | 10,413 | 105,928 | 2,906 | 4,449 | 179 |
| Softwoods | 10.4 | 19,843 | 11,406 | 132,334 | 3,573 | 4,148 | 716 |
| All timber | 12.0 | 37,790 | 21,819 | 238,262 | 6,479 | 8,597 | 895 |
| Volume used | -- | 30,560 | -- | -- | 2,792 | 5,533 | 416 |
| Volume unused | -- | 7,230 (19%) | -- | -- | 3,687 (57%) | 3,064 (36%) | 479 (54%) |

Maryland sawmill men are doing pretty well in cutting down on the "waste." They are cutting narrow and short lumber under the slab. They are making less sawdust by using thin saws and by putting a big part of their center cuts into big timbers. In fact, Maryland sawmills now produce less residue in relation to product than any of the other basic wood-using industries in the State.

In 1952 Maryland sawmills put 57 percent of the cubic volume of their logs into their primary products--rough green lumber and timbers. But Maryland veneer mills got only 53 percent of their log volume into green veneer. The pulp mills in the State got only 45 percent (dry weight) of their wood into dry wood pulp. Cooperage plants got only 35 percent of their raw material into rough green staves and heading. And the shoe-last and bowling-pin industry got only 19 percent of their log volume into rough-turned bowling pins and shoe lasts.

There are ways to improve sawmill output still more. One way is more accurate sawing. In this respect Maryland

Figure 1.--Some leftovers are unavoidable in making lumber out of logs. The study showed that sawmill men in Maryland are making comparatively little 'waste.'

sawmills were doing only a fair job. The lumber and timbers they turned out in 1952 averaged almost 15 percent over the nominal dimensions. About half of this excess was in thickness, the other half in width and length.

Many of the sawmills in the State are old, and parts such as setworks and bolster slides are so badly worn that accurate sawing is practically impossible. The millmen meet this problem by adjusting their setworks to cut greater thickness, to make sure the scanter boards will still be of nominal thickness. As a result, many boards are thicker than they need be, and the lumber yield is less than it should be. The excess wood goes into shavings when the lumber is planed to finished size.

The sawmill residues are not necessarily "waste." Maryland sawmill men are finding uses for more than half of the sawdust, slabs, edgings, and shavings their mills make (table 1). Only 19 percent of the green cubic volume of wood in sawlogs used in 1952 was completely unused at the time of the study. No doubt this 19 percent will be reduced further as time goes on, for sawdust and slabs at abandoned mill sites are often picked up by people who have some use for it.

So it would seem that Maryland sawmills have their "waste" problem pretty well in hand. However, further improvement is possible by: (1) more accurate sawing; (2) encouraging use of leftovers for the currently popular purposes; and (3) finding new uses for some of the material that is now used unprofitably or is being given away. These possibilities will be discussed in more detail in the pages that follow.

## LUMBER PRODUCTION IN 1952

As a basis for determining volume of residues, an estimate of lumber production was made. In 1952, Maryland's sawmill industry was operating at a high rate of production (table 2). It produced nearly 106 million board feet of hardwood lumber and more than 132 million board feet of softwood lumber. Total production was more than 238 million board feet.[1]

For comparison, in 1947 Maryland sawmills produced 153 million board feet of lumber, according to the U. S. Census of Manufacturers. Of this, 87 million was softwood, 66 million hardwood. After the high rate of production in 1952, lumber demand seems to have slackened somewhat, and Maryland sawmills did not produce at so high a rate in 1953.

Of course the volumes given in table 2 are estimates of the timber processed at Maryland sawmills in 1952. They include the volume of logs cut from timber in other states

[1] OFFICIAL BUREAU OF THE CENSUS ESTIMATES OF 1952 LUMBER PRODUCTION ARE NOT AVAILABLE FOR MARYLAND. REGIONAL CENSUS STATISTICS ON LUMBER PRODUCTION ARE EXPECTED TO BE AVAILABLE ONLY FOR THE NORTHEASTERN STATES AS A GROUP.

Table 2.--Estimated production of Maryland sawmills, 1952

| District & county | Mills | Volume sawed | | | Average log diameter |
|---|---|---|---|---|---|
| | | Hardwoods | Softwoods | Total | |
| | No. | M bd.ft. | M bd.ft. | M bd.ft. | Inches |
| EASTERN SHORE | | | | | |
| Talbot | 12 | 1,538 | 6,076 | 7,614 | 9.9 |
| Caroline | 19 | 1,180 | 3,753 | 4,933 | 9.3 |
| Dorchester | 35 | 916 | 15,164 | 16,080 | 9.3 |
| Worcester | 24 | 3,514 | 24,718 | 28,232 | 10.6 |
| Somerset | 27 | 2,465 | 15,751 | 18,216 | 10.6 |
| Wicomico | 22 | 2,046 | 33,524 | 35,570 | 9.8 |
| Total | 139 | 11,648 (11%) | 98,986 (89%) | 110,634 | 10.04 |
| NORTHEAST | | | | | |
| Queen Annes | 12 | 1,591 | 102 | 1,693 | 15.7 |
| Kent | 6 | 243 | 91 | 334 | 16.6 |
| Cecil | 17 | 6,644 | 22 | 6,666 | 17.5 |
| Harford | 23 | 5,238 | 37 | 5,275 | 17.0 |
| Baltimore | 23 | 3,927 | 27 | 3,954 | 17.7 |
| Carroll | 16 | 3,955 | 22 | 3,977 | 16.5 |
| Total | 97 | 21,598 (99%) | 301 (1%) | 21,899 | 17.1 |
| WESTERN | | | | | |
| Washington | 20 | 9,001 | 639 | 9,640 | 13.3 |
| Frederick | 35 | 3,330 | 33 | 3,363 | 14.5 |
| Allegany | 16 | 3,798 | 514 | 4,312 | 12.3 |
| Garrett | 53 | 16,052 | 585 | 16,637 | 10.8 |
| Total | 124 | 32,181 (95%) | 1,771 (5%) | 33,952 | 12.0 |
| SOUTHERN | | | | | |
| Montgomery | 20 | 5,320 | 897 | 6,217 | 15.6 |
| Howard | 19 | 4,066 | 317 | 4,383 | 16.9 |
| Prince Georges | 21 | 4,800 | 533 | 5,333 | 12.1 |
| Anne Arundel & Calvert | 24 | 10,027 | 610 | 10,637 | 13.6 |
| Charles | 21 | 11,750 | 3,931 | 15,681 | 15.8 |
| St. Marys | 30 | 4,538 | 24,988 | 29,526 | 11.7 |
| Total | 135 | 40,501 (56%) | 31,276 (44%) | 71,777 | 13.5 |
| State total | 495 | 105,928 | 132,334 | 238,262 | 12.0 |

and brought into Maryland for processing. They do not include the volume of logs cut in Maryland and taken to sawmills in other states. Consequently they should not be interpreted as estimates of the sawlog volumes cut in the State.

The leading counties in lumber production in 1952 were Wicomico, St. Marys, Worcester, Somerset, Garrett, and Dorchester (table 2). Four of these counties are on the Eastern Shore, and the other two are at the extremities of southern and western Maryland. Note (table 2) the small average size of the logs sawed, especially in these leading counties.

Most of the lumber produced on the Eastern Shore and in St. Marys County is softwood, primarily loblolly pine and Virginia pine. In the rest of the State hardwood lumber is more important. Just about half of the hardwood cut is of mixed oaks, and another fourth is of yellow-poplar.

Only in northeastern Maryland and in Howard County do the sawmills get logs that average larger than 16 inches in diameter. Part of the reason for this is that large logs are imported into this area, to be made into large timbers and industrial blocking for the heavy industries in the area. The "waste" in sawing these larger logs is proportionally much less than that from sawing the smaller hardwood logs that mills elsewhere in the State get.

## PRODUCTION AND DISPOSAL OF SAWDUST

The amount of sawdust made depends on the average width of the kerf cut by the saw, and the thickness of the lumber produced.

Maryland sawmills, especially those that cut softwoods, use relatively thin circular saws. They can do this because they cut logs of fairly small diameter and do not need large saws. In Maryland sawmills 36-inch headsaws are not uncommon; and saws larger than 54 inches in diameter are rare. These smaller saws used in Maryland are of 9- to 10-gage thickness. Larger saws this thin would be subject to strains and kinks, and would call for constant and expert maintenance. The same is true for thinner saws of the size now being used. One sawmill man in Western Maryland was found who was cutting a 14/64-inch kerf with a 12-gage saw. But this was exceptional: he was able to do his own tensioning when the blade developed kinks or lost its tension.

There is only one bandsaw mill in Maryland that concerns us[2]; it is in St. Marys County. Thanks to this mill, St. Marys County has the narrowest average width of saw kerf in the State (12.5/64 inch). Bandsaw mills are more expensive to buy and to maintain than circular mills. Bandsaw maintenance requires special equipment and special skills. That is probably why some of the other large mills in the State do not use bandsaws.

The thickness of the lumber and timbers produced is as important as width of kerf in determining the amount of sawdust produced. For example, in northeastern Maryland 36 percent of the sawmill output is in timbers 4 inches or more thick; and in western Maryland 48 percent of the output is in thick stock. These mills make less sawdust per 1,000 feet cut than the mills in southern Maryland, where only 19 percent of the output is in thick stock. On the Eastern Shore 29 percent of the output is in thick stock.

The data compiled on production and disposal of sawdust are given in table 3. The volumes of sawdust produced were computed in tons, dry weight, because this seems to be the most convenient and most easily understood unit of measure. Weight varies by species sawed. In this study the oven-dry weight of sawdust, gravity pack, averaged out as follows:

| Mills cutting-- | Pounds per cubic foot |
|---|---|
| Yellow pine | 10.4 |
| Mostly oak | 12.3 |
| Mostly yellow-poplar | 10.5 |
| Mixed hardwoods | 11.5 |

Moisture content in the fresh sawdust measured varied from 30 to 50 percent of the total weight of the sawdust as produced, depending on the dryness of the logs sawed and the methods of sawdust handling. (Blowing dries out the sawdust more than handling it with a "doodler" or chain.)

The current use of sawdust at the mills is particularly interesting. Sawdust used for fuel usually goes into steam boilers at the mills producing the dust. With the swing to diesel and commercial electric power at small mills,

[2]THERE IS A BANDSAW MILL THAT CUTS MAHOGANY FOR A VENEER PLANT, BUT IT DOES NOT ENTER AT ALL INTO THE PROBLEM OF "WASTE" OF DOMESTIC TIMBER.

Table 3.--Production and disposal of sawdust by Maryland sawmills, 1952

(In tons, dry weight)*

| District & county | Average kerf | Sawdust produced | Sawdust used for-- | | | Unused |
|---|---|---|---|---|---|---|
| | | | Fuel | Agriculture | Other | |
| | /64ths inch | Tons | Tons | Tons | Tons | Tons |
| EASTERN SHORE | | | | | | |
| Talbot | 16.8 | 3,248 | 32 | 1,424 | -- | 1,792 |
| Caroline | 16.8 | 2,512 | 128 | 2,032 | -- | 352 |
| Dorchester | 17.0 | 7,248 | -- | 800 | 288 | 6,160 |
| Worcester | 17.0 | 11,536 | 1,040 | 5,184 | 352 | 4,960 |
| Somerset | 16.7 | 8,320 | 80 | 4,336 | 2,160 | 1,744 |
| Wicomico | 16.7 | 15,024 | 1,056 | 9,920 | 304 | 3,744 |
| Total | -- | 47,888 | 2,336 (5%) | 23,696 (50%) | 3,104 (6%) | 18,752 (39%) |
| NORTHEAST | | | | | | |
| Queen Annes | 17.5 | 672 | -- | 528 | 16 | 128 |
| Kent | 17.8 | 128 | -- | 96 | -- | 32 |
| Cecil | 17.4 | 2,656 | -- | 1,632 | 48 | 976 |
| Harford | 17.0 | 2,496 | -- | 1,824 | 224 | 448 |
| Baltimore | 17.8 | 1,872 | 560 | 1,168 | 48 | 96 |
| Carroll | 18.0 | 1,888 | -- | 560 | 32 | 1,296 |
| Total | -- | 9,712 | 560 (6%) | 5,808 (60%) | 368 (4%) | 2,976 (30%) |
| WESTERN | | | | | | |
| Washington | 17.2 | 4,464 | -- | 224 | -- | 4,240 |
| Frederick | 17.0 | 1,552 | -- | 704 | 32 | 816 |
| Allegany | 16.8 | 2,000 | -- | 432 | -- | 1,568 |
| Garrett | 16.8 | 7,760 | 464 | 1,472 | -- | 5,824 |
| Total | -- | 15,776 | 464 (3%) | 2,832 (18%) | 32 | 12,448 (79%) |
| SOUTHERN | | | | | | |
| Montgomery | 16.9 | 2,800 | -- | 944 | 592 | 1,264 |
| Howard | 16.9 | 2,032 | -- | 288 | 528 | 1,216 |
| Prince Georges | 17.1 | 2,784 | -- | 944 | 80 | 1,760 |
| Anne Arundel & Calvert | 17.3 | 4,800 | -- | 288 | -- | 4,512 |
| Charles | 12.5 | 6,016 | 1,808 | -- | -- | 4,208 |
| St. Marys | 17.0 | 11,856 | -- | -- | -- | 11,856 |
| Total | -- | 30,288 | 1,808 (6%) | 2,464 (8%) | 1,200 (4%) | 24,816 (82%) |
| State total | -- | 103,664 | 5,168 (5%) | 34,800 (33%) | 4,704 (5%) | 58,992 (57%) |

*Weight as produced, including moisture, will be 60 to 100 percent more than the dry-weight values given.

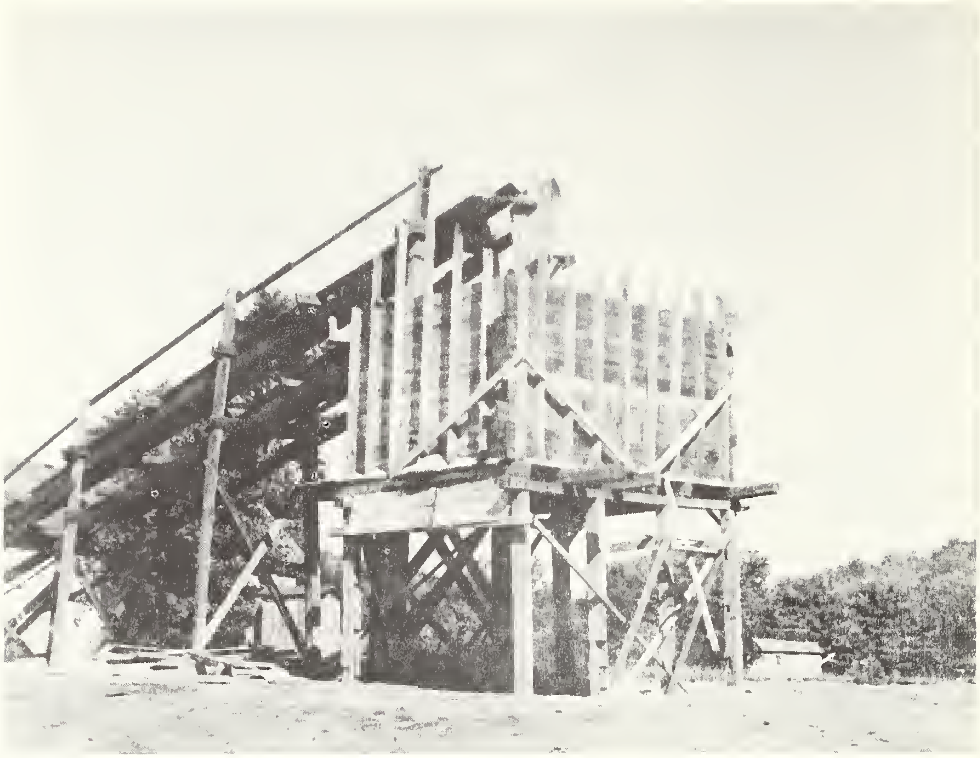

Figure 2.--Sawdust hoppers like this one are helpful in disposing of sawdust. A truck can be loaded from this hopper in a few minutes. Use of sawdust in agriculture has increased greatly in recent years.

this type of use is undoubtedly decreasing. There are no previous similar data for Maryland, but in 1944 use of sawdust for fuel in the entire Middle Atlantic region was estimated to be 29 percent of that produced. In 1952 Maryland mills used only 5 percent of their sawdust for fuel.

Use of sawdust for agriculture has increased rapidly in recent years. Most of the sawdust picked up by farmers is first used as bedding, either for dairy cattle or in poultry houses, and then the used bedding is spread on the land. With the swing to tractors as motive power on farms, not as much feed grain is being raised as formerly. Consequently, the supply of straw has dropped off. Numerous substitutes for straw bedding are being tried, but wood fragments are apparently the most popular. It will be noted that this use is confined in Maryland largely to the Eastern Shore and the northeastern part of the State, where the livestock industry is most prevalent.

Some soil specialists recommend that raw wood fragments, such as sawdust, be used directly on the soil to improve its water-holding capacity and physical condition. There is one drawback to this practice: the bacteria that multiply in the soil to rot the sawdust also commandeer a portion of the available soil nitrogen. With wood used as stock bedding, this nitrogen demand is met by the included animal excrement. But if raw wood is placed on the soil, it should be accompanied by some other source of nitrogen, either in commercial fertilizer or some such substance as sewage sludge. Experiments are being conducted at a number of the agricultural experiment stations in the Northeast on the details of these practices.[3] They would seem to be particularly applicable to an area like southern Maryland, where large quantities of sawdust and shavings are available.

The "other" uses of sawdust include everything from use as land fill and in school jumping pits to use as a component in making fire brick. The latter use is particularly important in the Baltimore-Washington area, where there are a number of brick manufacturers. The sawdust is added to the clay mix. It burns out during the baking period, leaving the brick porous and giving it better insulating properties than solid brick. Sawdust is also used as a base for floor-sweeping compounds, sidewalk de-icers, and floor-covering for slaughter houses and old-fashioned barrooms.

Many sawmills pay their fuel bills these days from the money they receive for sawdust. The average price they receive is probably around $5 a ton, wet weight. It seems probable that sawdust use, particularly for agriculture, will continue to increase and that more Maryland millmen will be able to sell their sawdust at a profit.

## PRODUCTION AND DISPOSAL OF SLABS AND EDGINGS

The estimated amounts of coarse "waste" produced at Maryland sawmills in 1952, and the methods of disposal in that year, are summarized in table 4. These data are presented in terms of ricked cords of 4-foot lengths.

A ricked cord of slabs is not the same thing as a cord of round wood. The total volume in the stacked pile

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[3] ALLISON, F.E., AND ANDERSON, M.S. THE USE OF SAWDUST FOR MULCHES AND SOIL IMPROVEMENT. U.S. DEPT. AGR. CIR. 891. 19 PP., ILLUS. 1951

Table 4.--Production and disposal of slabs and edgings by Maryland sawmills, 1952

(In ricked standard cords)

| District & county | Amount produced | Slabs & edgings used for-- | | | | Unused |
|---|---|---|---|---|---|---|
| | | Fuel | Fiber | Agriculture | Other | |
| | | Cords | Cords | Cords | Cords | Cords |
| EASTERN SHORE | | | | | | |
| Talbot | 5,731 | 2,058 | -- | -- | 750 | 2,923 |
| Caroline | 4,750 | 4,519 | -- | -- | 19 | 212 |
| Dorchester | 10,211 | 5,827 | -- | 96 | 1,538 | 2,750 |
| Worcester | 16,115 | 9,346 | -- | -- | 808 | 5,961 |
| Somerset | 10,577 | 4,769 | -- | -- | 1,269 | 4,539 |
| Wicomico | 23,941 | 20,595 | -- | -- | 962 | 2,384 |
| Total | 71,325 | 47,114 (66%) | -- | 96 (1%) | 5,346 (7%) | 18,769 (26%) |
| NORTHEAST | | | | | | |
| Queen Annes | 1,211 | 1,204 | -- | -- | 7 | -- |
| Kent | 173 | 154 | -- | -- | 19 | -- |
| Cecil | 3,981 | 3,384 | -- | -- | 231 | 366 |
| Harford | 3,250 | 2,346 | -- | -- | 58 | 846 |
| Baltimore | 2,288 | 1,442 | -- | -- | 19 | 827 |
| Carroll | 2,365 | 2,173 | -- | -- | -- | 192 |
| Total | 13,268 | 10,703 (81%) | -- | -- | 334 (2%) | 2,231 (17%) |
| WESTERN | | | | | | |
| Washington | 7,750 | 4,500 | -- | -- | 77 | 3,173 |
| Frederick | 2,519 | 2,346 | -- | -- | -- | 173 |
| Allegany | 3,019 | 1,846 | -- | -- | 96 | 1,077 |
| Garrett | 18,749 | 3,558 | -- | -- | 1,500 | 13,691 |
| Total | 32,037 | 12,250 (38%) | -- | -- | 1,673 (5%) | 18,114 (57%) |
| SOUTHERN | | | | | | |
| Montgomery | 4,000 | 3,442 | -- | -- | 38 | 520 |
| Howard | 2,865 | 2,038 | -- | 19 | 38 | 770 |
| Prince Georges | 4,942 | 4,884 | -- | -- | 58 | -- |
| Anne Arundel & Calvert | 10,019 | 9,923 | -- | -- | -- | 96 |
| Charles | 10,846 | 7,153 | -- | -- | -- | 3,693 |
| St. Marys | 16,019 | 1,288 | -- | -- | -- | 14,731 |
| Total | 48,691 | 28,728 (59%) | -- | 19 | 134 | 19,810 (41%) |
| State total | 165,321 | 98,795 (60%) | -- | 115 (*) | 7,487 (4%) | 58,924 (36%) |

*Less than ½ percent.

will be about the same (in the neighborhood of 80 cubic feet), but while the round wood will carry 12 to 16 percent bark, depending on species, the pile of slabs will contain

Figure 3.--Slabs and edgings are sometimes difficult to dispose of. Pulp mills will not accept them because they contain too high a proportion of bark. This mill is burning slabs and edgings to get rid of them.

25 to 40 percent bark. Consequently, as shown by our studies, ricked cords of 4-foot slabs at Maryland sawmills average about 52 cubic feet of solid wood content per cord.

This does not affect the fuel value of a cord appreciably, as compared to round wood. Bark of most of our native species has as much fuel value as wood. Nearly 100 thousand cords of coarse sawmill residues produced in Maryland in 1952 were used as fuel, either at the producing plant, or hauled away for use by others. A considerable amount of the pine slabs produced on the Eastern Shore is given to the mill labor. In other sections, particularly in northeastern Maryland and around Washington, hardwood slabs are salable at a good price. Many mills are selling their slabs cut to stove length to be picked up by the purchaser in the mill yard, at $5 a "thrown cord."

In western Maryland, close to the coal mines, there is less demand for wood for fuel than in the urban coastal area.

In 1952, there was no use of slabs and edgings in Maryland for fiber production. That is to say, none of this material was accepted by the pulp mills. The principal difficulty is that this sawmill refuse has too high a percentage of bark. Some alkaline-process mills drawing wood from Maryland are now cooking round wood with the bark on, but will not consider accepting slabwood that contains two or three times as much bark as round wood does.

In Southern and Western States a number of sawmills have installed log debarkers. These remove the bark from the log before it is put on the carriage. According to all reports, sawmills generally find that this debarking pays. Saws need to be filed only one half to one third as often, and sawing is more accurate. The debarked slabs and edgings, of course, are readily salable as pulpwood. However, the most successful of these debarkers are large high-production units, costing $30,000 or more. Generally a mill producing less than 20 or 30 thousand board feet a day cannot consider installing one. There are only two or three mills larger than this size in Maryland.

One manufacturer has developed an experimental model of a log-debarking machine different in type from the others, which can be sold for about $10,000. If this proves successful it would be in balance with a daily output of only about 10,000 board feet. There are about 12 mills of this size in Maryland.

Another approach to the debarking problem, which has greater promise for the many small mills, is chipping the slabs and edgings with the bark on and then separating the bark from the wood after it has been chipped. At least three different and promising devices for doing this are being worked out. In fact the manufacturers claim all three are now ready for commercial application.

With such devices, slabs and edgings from a number of small mills could be collected at some central point, probably at a railroad siding, or at the pulp mill itself. There they could be chipped, the wood separated from the bark, and the wood portion used for pulp manufacture. The bark, in many cases, could be sold locally for livestock bedding or mulching material.

Economical methods for collecting slabs and edgings from a number of small mills over a radius of 20 to 30 miles are now in use in northwestern Pennsylvania and southwestern New York State. All the sawmill man has to do is throw his coarse residues on a waiting pallet or buggy, full length. Then a self-loading truck comes around, drops an empty pallet, and hauls the filled one to the central chipping plant.

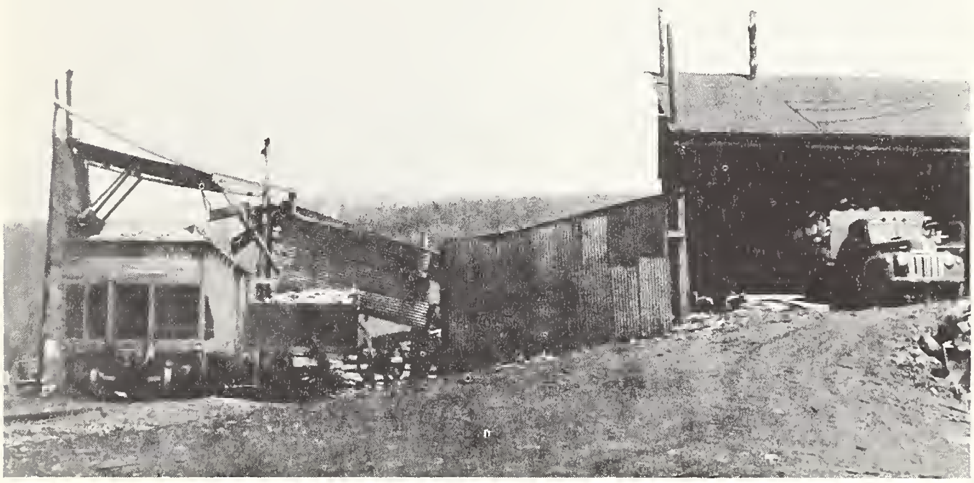

Figure 4.--New uses for slabs and edgings are being developed. At this railroad siding in Pennsylvania, slab material is made into chips for metallurgical uses. The material is brought to the chipping mill in pallets carried by a self-loading truck (right).

It is probably only a matter of time before similar collection systems are put into operation in Maryland. This may come about first on the Eastern Shore, where a new softboard pulp plant is being considered that will compete for pine pulpwood with the many mills that now draw on that area. Such a system may develop almost as soon in western Maryland, where several pulp mills that use hardwoods (one in Maryland and three in nearby parts of Pennsylvania) are interested in developing a cheaper source of raw material.

Another potentially large and profitable use for slabs and edgings from Maryland sawmills is for the manufacture of charcoal. The demand for charcoal--especially for picnics and barbecues--is increasing by leaps and bounds in Maryland. So far practically all the charcoal used in Maryland has to be imported from other states. There is one small independent producer, and the State Department of Forests and Parks produces about 10 tons a year.

The big wood-distillation plants in northwestern Pennsylvania and the Catskill Mountains of New York State,

Figure 5.--Slabs and edgings can be used to make charcoal. Small kilns like this one have proved profitable in other parts of the Northeast.

which make charcoal, acetic acid, and wood alcohol from round wood, are passing out of the picture. They cannot compete with synthetic producers of acetic acid and methanol. Their place in charcoal production is being taken over by charcoal kilns of small and medium size (1- to 20-cord capacity). About 25 of these are in operation in New York and New England, all of them using slabs and edgings as raw material. Some of them are being operated by independent charcoal producers, some by the sawmill men themselves.

Installation of a 2-cord kiln costs only about $200. About 700 pounds of charcoal are obtained per cord of slabs and edgings used. Many producers are finding that they can sell their charcoal, packaged in 3- or 4-pound sacks, to local grocery stores and gasoline stations for 5 to 8 cents a pound, wholesale. The general market for charcoal in bulk for industrial use or for repackaging by city dealers is currently paying only $55 to $60 a ton.

More detailed information, including instructions for building and operating the kilns, can be obtained from the Connecticut Agricultural Experiment Station in New Haven, Connecticut, by asking for their bulletin, "The Connecticut Charcoal Kiln."

## PRODUCTION AND DISPOSAL OF SHAVINGS

Maryland sawmills planed only 50 million board feet of lumber in 1952, out of their total production of 238 million. Most of the material they planed was softwood.

The volume of shavings produced, and the disposal of them are shown in table 5. These figures include only the shavings produced at sawmills--and not those produced at independent planing mills and other wood-using industries in the State. So the volumes shown in table 5 represent only a part of the total volume of shavings available in Maryland in 1952.

Our study showed that the sawmills shaved off about 18 cubic feet of wood for every 1,000 board feet they planed. The large amount of this "waste" in planing is due to the mills sawing lumber oversize. If all the lumber planed were exactly 2 inches thick, and planing removed 1/4 inch of thickness (1/8 inch on each side), the wood shaved off would amount to only about 10 cubic feet per thousand. Since much of the material planed is dimension stock 2 inches thick or more, the volume taken off in shavings is almost twice as great as it would be for accurately cut stock.

Shavings are a favorite stock-bedding material, and the majority of the volume sold goes for this use. The

Table 5.--Production and disposal of shavings by Maryland sawmills, 1952

(In tons, dry weight)

| District & county | Shavings produced | Shavings used for-- | | | Unused |
|---|---|---|---|---|---|
| | | Fuel | Agriculture | Other | |
| | Tons | Tons | Tons | Tons | Tons |
| EASTERN SHORE | | | | | |
| Talbot | 240 | -- | 176 | -- | 64 |
| Caroline | 16 | -- | 16 | -- | -- |
| Dorchester | 96 | -- | 91 | 5 | -- |
| Worcester | 2,896 | 528 | 1,856 | -- | 502 |
| Somerset | 640 | -- | 640 | -- | -- |
| Wicomico | 2,368 | 304 | 2,064 | -- | -- |
| Total | 6,256 | 832 | 4,843 | 5 | 566 |
| NORTHEAST | | | | | |
| Queen Annes | 5 | -- | 5 | -- | -- |
| Kent | 3 | -- | 3 | -- | -- |
| Cecil | 90 | -- | 48 | -- | 52 |
| Harford | 32 | -- | 7 | -- | 25 |
| Baltimore | 30 | 16 | 14 | -- | -- |
| Carroll | -- | -- | -- | -- | -- |
| Total | 160 | 16 | 77 | -- | 77 |
| WESTERN | | | | | |
| Washington | -- | -- | -- | -- | -- |
| Frederick | 32 | -- | -- | -- | 32 |
| Allegany | -- | -- | -- | -- | -- |
| Garrett | 560 | -- | 304 | -- | 256 |
| Total | 592 | -- | 304 | -- | 288 |
| SOUTHERN | | | | | |
| Montgomery | 80 | -- | 80 | -- | -- |
| Howard | 48 | -- | 48 | -- | -- |
| Prince Georges | 272 | -- | 272 | -- | -- |
| Anne Arundel & Calvert | 144 | -- | 128 | -- | 16 |
| Charles | 1,040 | -- | -- | -- | 1,040 |
| St. Marys | 5,728 | -- | 64 | -- | 5,664 |
| Total | 7,312 | -- | 592 | -- | 6,720 |
| State total | 14,320 | 848 (6%) | 5,816 (41%) | 5 | 7,651 (53%) |

greatest accumulation of unused volume, however, is at the southern end of Maryland in Charles and St. Marys Counties, where there is little livestock industry. In similar circumstances, a number of pine mills in New England are baling their shavings in simple balers (costing about $1,500) and shipping them by rail to users who pay about $28 a ton, dry weight, for them. It would seem that this practice might be worth consideration by the southern Maryland mills.

About 6 percent of the shavings produced are used for fuel at the producing mills. This use is practically confined to the Eastern Shore.

# APPENDIX

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## METHODS USED AND RESULTS OBTAINED

In this survey of "waste" at Maryland sawmills, detailed studies were made at 11 mills, including 2 on the Eastern Shore, 3 in northeastern Maryland, 3 in southern Maryland, and 3 in western Maryland. Data from 10 mills in New England were also included in the results.

At each of these mills arrangements were made to have the "waste" from a known amount of lumber production set aside so it could be measured accurately. Usually this involved the production from 1 or 2 days' sawing.

Data were also obtained on the species composition of the cut; the average size of the logs sawed; the amounts of various thicknesses of lumber and timbers produced; and the actual sizes of the sawed products as compared with their nominal sizes.

### *Coarse Residues*

Measurement of the coarse residues, including slabs and edgings, and any cull lumber thrown out with them, was a rather simple process. In Maryland it was generally necessary to rick these residues in even piles. Mill labor usually volunteered to help with this. Then total gross cubic volume of the pile was obtained by multiplying length by width by height in feet.

The proportion of this over-all cubic volume occupied by wood substance was determined by application of a special measuring stick (fig. 6). This is a 4-foot stick with 16 spring-loaded retractable steel pins set in it at intervals of 3 inches. This stick was applied at intervals of about 2 feet along the ends of the pile, and the pins were pushed in to determine whether they hit wood, bark, or open space. With this the percentages of wood and bark in the pile were determined.

A typical calculation obtained this way follows:

Volume sawed for study: <u>1,250 board feet.</u>

Average log size: <u>12.5 inches.</u>

**Figure 6.--Use of the special measuring stick for determining the percentages of wood and bark in a pile of slabs and edgings.**

Coarse residue:

| Dimension of piles: | Length (feet) | Height (feet) | Width (feet) |
|---|---|---|---|
| | 16 | 4-1/3 | 1-1/4 |
| | 6 | 2-5/6 | 1-1/4 |

Calculated gross volume: 108 cubic feet.

Stacked volume per M sawed: 86.4 cubic feet.

Wood content of ricked piles:

Number of pins hitting solid wood: 115.

Total possible number: 198.

Percentage of wood in piles: 58 percent.

(The percentage of wood in these piles was high because the logs were old and much of the bark fell off in sawing and ricking.)

Calculated volume of solid wood in coarse residue per M board feet sawed: 50.1 cubic feet.

Factors were developed for each mill. On the average, ricked piles of slabs and edgings at Maryland mills contained about 52 percent wood content for stove-length wood (16 inches) and about 40 percent wood content for residues cut into 4-foot lengths. Bark content averaged 35 percent of the total solid wood volume in the pile.

A ricked cord (128 cubic feet of space) of slabs and edgings cut into 4-foot lengths from either pine or hardwood in Maryland was found to contain, on the average, 52 cubic feet of wood or 78.5 cubic feet of wood and bark. When cut into stove lengths it contained 66.5 cubic feet of wood, or 102 cubic feet of wood and bark. The shorter slabs, of course, nestled more compactly in the pile. A "thrown cord" of stove-length slabs and edgings in a truck or wagon of 128-cubic-foot capacity was found to be a very variable unit of measure; it averaged about 70 cubic feet of wood and bark.

*Sawdust*

Measurement of sawdust was more complicated. At many mills sawdust bins were found to be available. In these cases it was relatively easy to obtain the gross cubic volume of sawdust produced, gravity pack. At others it was necessary to measure the dust in the open, in the conical pile that developed under the "doodler," after the previously accumulated pile had been levelled off.

To obtain volume of wood in sawdust, several samples were taken from a measured cubic foot in a plywood box. Net weight of the green sawdust per cubic foot was determined. To obtain moisture content, a typical sample of the sawdust was taken in a sealed jar. It was weighed, dried out to equilibrium in an electric oven (at 100° Centigrade), and weighed again. Finally, these measurements were converted to solid green wood equivalent by applying the factors below.

Weight per cubic foot, oven dry, based on volume when green

| | (Pounds) | | (Pounds) |
|---|---|---|---|
| Oak | 36.7 | White pine | 21.2 |
| Northern hardwoods | 35.2 | Yellow pine | 28.9 |
| Other hard hardwoods | 35.9 | Hemlock | 23.6 |
| Yellow-poplar | 24.6 | Other softwoods | 30.6 |
| Other soft hardwoods | 26.9 | | |

These factors were obtained from average weights of various species as determined over the years at the U. S. Forest Products Laboratory at Madison, Wisconsin.

A typical calculation of sawdust volume, green solid wood equivalent, follows:

Volume sawed for this study: 17,793 board feet.
(2% oak, 9% yellow-poplar, 89% other soft hardwoods)

Average log size: 16 inches.

Sawdust:

| | |
|---|---|
| Total volume (gravity pack): | 1,574 cubic feet |
| Volume per M. sawed: | 88.5 cubic feet |
| Average green weight per cubic foot: | 16.85 pounds |
| Moisture content: | 38.1 percent |
| Calculated dry weight per cubic foot: | 10.3 pounds |

Calculated total dry weight of sawdust (including bark) per M sawed: 910.5 pounds.

Bark content 5 percent. Dry weight, wood only 865 pounds.

Average dry weight per cubic foot of species sawed: 26.8 pounds.

Solid wood equivalent of bark-free sawdust per M sawed: 32.3 cubic feet.

*Lumber Measurements*

Finally, to obtain an idea of the total cubic volume going through the mill, a representative sample of the lumber and timbers sawed was measured. These measurements were also used to determine how much the lumber and timbers varied from the nominal sizes upon which board-foot volume measurements were based.

Thicknesses were measured at the center and 2 feet in from the ends, in terms of 16ths of an inch over or under the nominal size. Actual widths were measured on hardwood lumber. Widths of softwood lumber were measured in terms of 8ths of an inch over and under nominal size. Timbers--both hardwood and softwood--were also measured in 8ths of an inch over and under nominal size. Lengths of both hardwood and softwood lumber were measured in 10ths of a foot over the next lower full foot of length.

The results were figured in percentage over the nominal sizes intended to be sawed. The average variation from the nominal sizes found at Maryland mills was as follows:

| | Excess over nominal size | | |
|---|---|---|---|
| | Thickness (Percent) | Width (Percent) | Length (Percent) |
| Hardwood mills | 11.4 | 3.5 | 3.3 |
| Softwood mills | 4.9 | 2.4 | 2.2 |

As an example, the following data on the thicknesses cut were obtained from 130 measurements of 4/4 lumber produced by a mill cutting pine on the Eastern Shore:

| 16ths inch over nominal size | Measurements obtained (Number) |
|---|---|
| 0 | 16 |
| 1 | 24 |
| 2 | 48 |
| 3 | 22 |
| 4 | 16 |
| 5 | 4 |

Apparently this mill was set to saw 1/8 inch over nominal size, but even in its present state of repair it could have been set to saw a 16th less and still not have had any thickness in this sample of less than 7/8 inch. With better maintenance a lesser spread in the thicknesses sawed could be expected.

At a hardwood mill in western Maryland the following results were secured on 156 measurements of nominal 4/4 lumber:

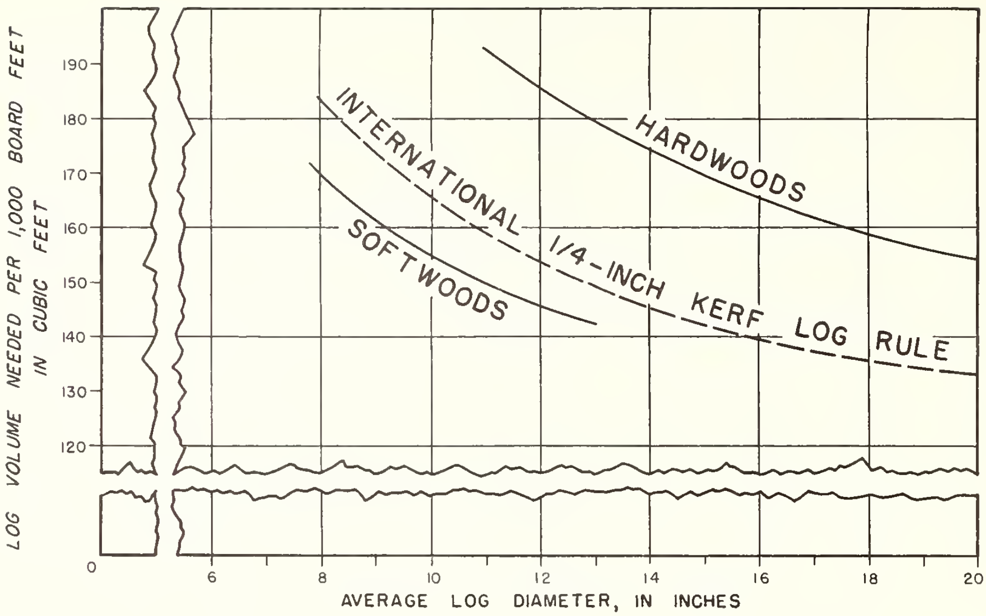


Figure 7.--The total cubic volume of logs needed by circular sawmills in Maryland to produce 1,000 board feet of lumber. This graph is based on cutting of lumber and dimension stock less than 4 inches thick.

| 16ths inch over nominal size | Measurements obtained |
|---|---|
| | (Number) |
| 0 | 0 |
| 1 | 4 |
| 2 | 12 |
| 3 | 16 |
| 4 | 68 |
| 5 | 32 |
| 6 | 15 |
| 7 | 9 |

This mill had evidently been set to saw 1/4 inch over nominal size, but 36 percent of the boards sawed were at least a 16th inch over that size, and 22 percent were below it.

Some shrinkage in drying is to be expected in this lumber before planing. This was frequently advanced by the millmen as the reason for the excessive thicknesses they

Table 6.--Average cubic volume of lumber and residues per 1,000 board feet of lumber produced

SOFTWOOD SAWMILLS

(Cutting lumber and dimension)

| Average log diameter (inches) | Lumber | Sawdust | Slabs, edgings, and trim | Total |
|---|---|---|---|---|
| | Cubic feet | Cubic feet | Cubic feet | Cubic feet |
| 8 | 91. | 33.0 | 46.5 | 170.5 |
| 9 | 91. | 30.5 | 40.0 | 161.5 |
| 10 | 91. | 29.0 | 36.0 | 156.0 |
| 11 | 91. | 27.5 | 32.5 | 151.0 |
| 12 | 91. | 26.0 | 29.0 | 146.0 |
| 13 | 91. | 25.0 | 27.0 | 143.0 |
| HARDWOOD SAWMILLS | | | | |
| 11 | 98.5 | 38.0 | 56.0 | 192.5 |
| 12 | 98.5 | 36.0 | 51.5 | 186.0 |
| 13 | 98.5 | 35.0 | 46.5 | 180.0 |
| 14 | 98.5 | 34.0 | 42.5 | 175.0 |
| 15 | 98.5 | 33.0 | 38.5 | 170.0 |
| 16 | 98.5 | 32.5 | 35.5 | 166.5 |
| 17 | 98.5 | 31.5 | 32.5 | 162.5 |
| 18 | 98.5 | 31.0 | 30.0 | 159.5 |
| 19 | 98.5 | 30.5 | 27.5 | 156.5 |
| 20 | 98.5 | 30.5 | 25.5 | 154.5 |

were producing. They said that shrinkage from green to air-dry was frequently as high as 10 percent, particularly in fast-grown yellow-poplar.

It is possible that shrinkage as great as this is being encountered; but since very little of this lumber was quarter-sawed, the shrinkage would show up as loss in width rather than in thickness.

Excess lengths usually can be traced back to poor bucking practice in the woods, but sometimes they are due to inaccurate trimming at the mill. The extra length is often justified by the millman as an attempt to minimize the effect on the finished lumber of the checking that may occur during drying.

*Factors Obtained*

The data collected in these studies were checked against information from similar studies in other regions, and particularly against the formulas used in constructing the International $\frac{1}{4}$-inch kerf log rule, which was based on measurements at a number of sawmills in the Northeast and eastern Canada. As in other studies, average diameter of log sawed proved to be more important in controlling volume of mill residues produced than sawing practices followed, type of mill, or any other variable.

Curves were drawn from these data to represent the total cubic volume of wood brought to the mill per 1,000 board feet sawed (fig. 7); cubic volume of wood going into sawdust per 1,000 board feet sawed (fig. 8); and cubic vol-

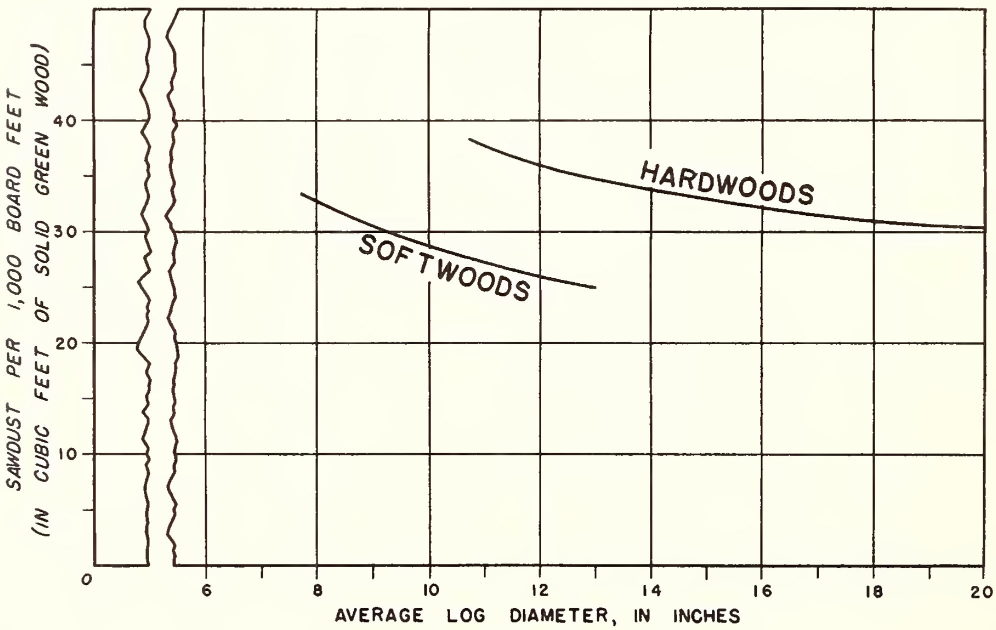


Figure 8.--The volume of solid green wood converted into sawdust for every 1,000 board feet of lumber produced at circular sawmills in Maryland. This graph is based on mills cutting lumber and dimension stock less than 4 inches thick.

ume of wood put into slabs, edgings, and other coarse residues per 1,000 board feet sawed (fig. 9). These curves were correlated with the International rule. Average diameter of the logs sawed is the independent variable in all of these curves. The tabular data in table 6 are taken from these curves.

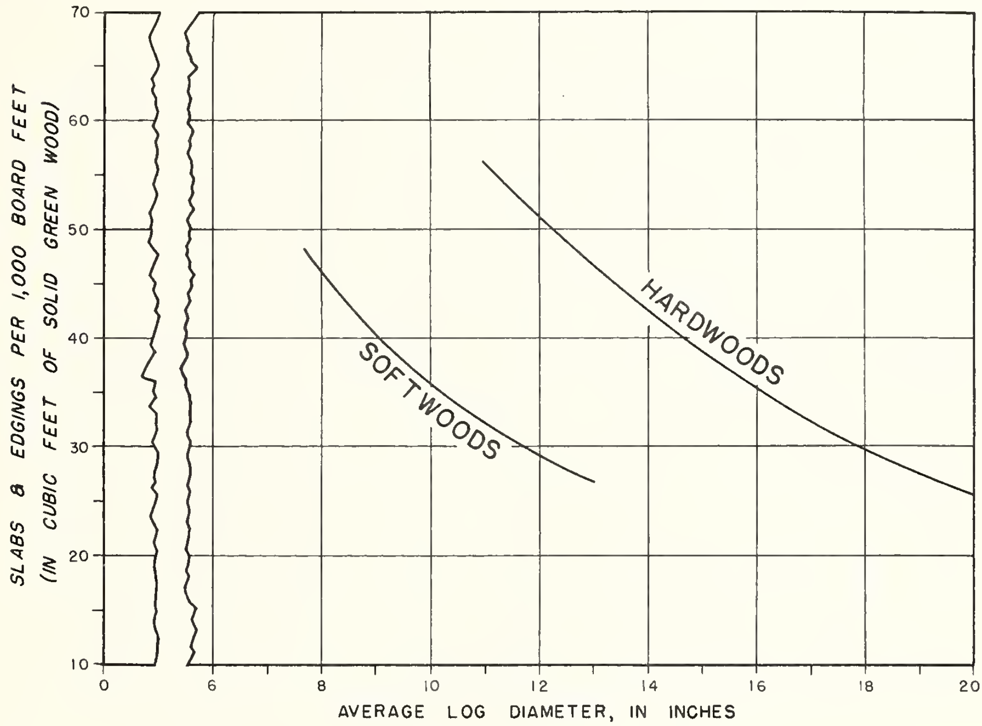


Figure 9.--The volume of solid green wood converted into slabs and edgings and other coarse residues for every 1,000 board feet of lumber produced by circular sawmills in Maryland.

In compiling the tabular figures on residue volumes, these factors, varying with average log diameters reported, were applied (separately for hardwoods and softwoods) to the mill production information obtained in the survey. Sawdust produced at the bandsaw mill was found to be about one half that produced at the average circular mill from the same type of logs. For mills cutting timbers (material 4 inches thick or more) the sawdust figures were reduced by the amounts shown in figure 10.

It is believed that the reasons why so much greater cubic volumes of hardwood logs have to be handled to make a thousand board feet of lumber are: that the hardwoods are more defective than the softwoods, and that hardwood logs tend to deviate more from the form of a true section of a cone than softwoods. They have more taper, especially in swelled-butt logs, they are more apt to be crooked, and they have more bumps and other irregularities. Heavier saws are used in cutting hardwoods. The greater tendency to saw hardwood lumber oversize also has an influence.

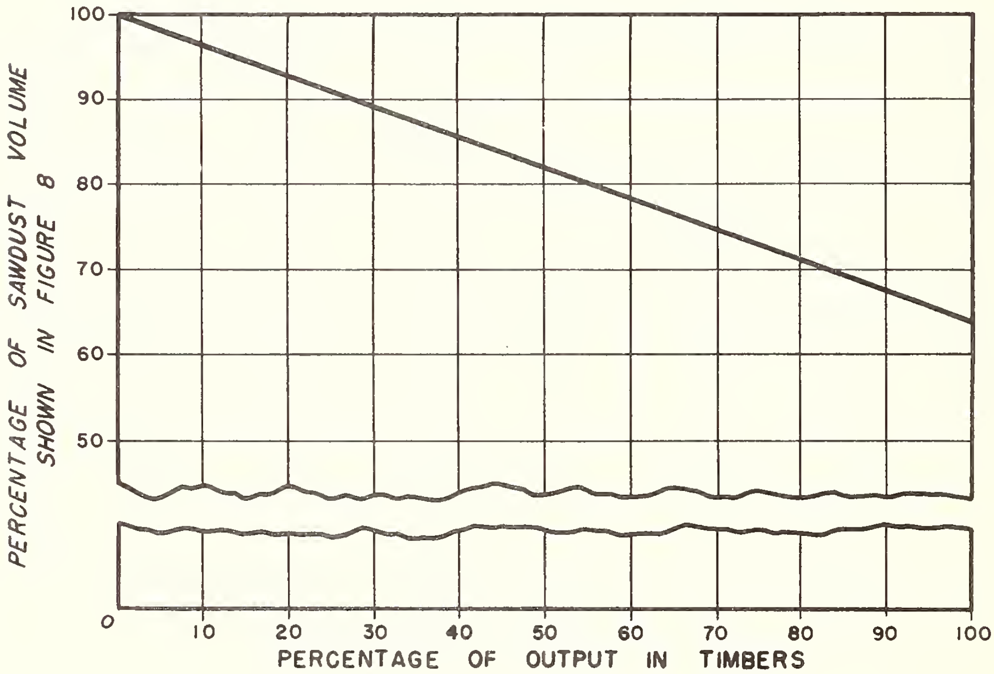


Figure 10.--Correction factors for sawdust volume, for percentage of mill output going into timbers 4 inches thick or larger.

All these things also influence the greater production of sawdust, and the much larger amounts of coarse residues, including slabs, edgings, and trim, produced at hardwood mills per thousand board feet sawed.

This does not necessarily mean that hardwoods will underrun the International scale when it is correctly applied.

Unfortunately, there was no opportunity to obtain an accurate scale of the logs sawed at most of the mills included in these studies. But in the few cases where the logs were scaled with the International $\frac{1}{4}$-inch log rule, with due allowance for cull and irregularities, the scaled volumes of hardwood logs were generally less than, but very close to, the lumber output obtained. Where softwoods were scaled a considerable overrun developed, averaging about 10 percent.

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